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SCIENTIFIC AMERICAN SUPPLEMENT

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THE NEW WORKS OF SCIENCE.

As the proud nineteenth century draws to a close it would seem that its representatives have good reason to be proud of the legacy to be left by them to succeeding ages. The last century saw the infancy of the steam engine, saw the isolation of oxygen gas and of a few other substances in the field of chemistry, and that is nearly all in science given to the present age by its predecessor. Before 1800 the cities of the world were still lighted by lamps and candles; electricity had its highest development in the inefficient frictional electric machines; railroads and steamboats were not yet a factor in transportation, and even the roads of England had but begun to be made; the age that there is nothing new under the sun applied with full force to the few achievements in science of the world one hundred years ago.

Then the nineteenth century commenced. Gas lighting was introduced and the nocturnal crimes of great cities almost ceased. Lavoisier's and Priestley's discovery of oxygen began to bear fruit, and modern chemistry, which is a little over a century old, gradually took a position in the world of science. The galvanic battery gave strong current electricity, Sir Humphry Davy produced the electric light and the metals of the alkalies; the steamboat, locomotive and telegraph came into existence, and for a time it seemed as if man had all he could attend to in developing the new discoveries. Faraday's investigations led to the invention of the magneto generator; slowly the idea of a self-exciting dynamo was developed, and slowly enough the world awoke to the idea that the old prophecy of Goethe, that electricity only applied to the smaller business of life, might be falsified. Then, just as the use of currents of electricity of engineering dimensions was being developed, the almost imperceptible but delicately governed induced current was made to produce the transmission of speech; so that now, in our utilization of the thousand horse power units of electricity for engineering work, and of the minute, almost absolute units for telephonic work, we seem equally to avail ourselves of the colossal and of the microscopic powers, of electricity.

The assertion of the progress in science of this century is not needed, and a year ago it would have seemed trite enough to have exalted its achievements. But now, within a few years of the new century, and all within the space of a few months, developments and discoveries, few in number, but of importance enough and wonderful enough to fairly overthrow all our ideas of the limitations of man's power, have been thrust upon us.

The subject of the liquefaction of gases has long been a fascinating one for the physicist and experimenter. Chlorine and carbon dioxide were among the first, a number of years ago, to succumb to pressure, and after awhile scientists established two classes of gases, the fixed and the liquefiable gases. This division no longer exists. All the elemental gases have been liquefied, and the apparatus has been so perfected that with comparatively simple appliances, and in a space of ten minutes, liquid air can be collected like water in an open vessel, and the assertion has been made within a few months, by one of the best qualified investigators of the world, that in the near future liquid air will probably be the great source of artificial cold. Even more wonderful is the liquefaction of air produced by the cold due to its own expansion, which has been accomplished recently on what may be termed the commercial scale. We may within a few years see liquid air supplied and used by the liter like any common chemical.

The old time gas engineer produced hydrocarbon gases from hydrocarbons prepared in preceding geologic ages by the mighty forces of nature working through the quiet agency of the profuse plant life of the carboniferous and other eras. The dreams of the advanced technologist, who recognized the crudeness of the coal gas and water gas processes, the latter seeming but slightly an advance over its predecessor, would sometimes take the shape of the future synthesis or direct combination of carbon and hydrogen. If this could be done on the large scale, gas making would stand upon a new and scientific footing. The later triumphs of chemistry are largely in this field of synthesis, and now, in the direct production on the large scale of a hydrocarbon, chemistry has distanced its greatest achievements of the past as far as the technical field is concerned. Acetylene will always remain one of the milestones of the world's progress. Its production is due to the development of the dynamo—it is a gift made by physics to its sister science, chemistry.

The analysis of air was early attempted, and has been made so often that it seemed as if its composition was settled forever. It was always treated as of fixed composition, no variation being found in it wherever collected, unless artificially contaminated. But within a few months the world of science was startled to hear that an element hitherto undiscovered was a constituent of air, and that its composition had never been correctly determined; the new analysis showed the existence in air of the strange neutral element, argon. Argon and acetylene represent triumphs of the opposite branches of chemistry—of analysis and of synthesis respectively.

And now the world is electrified over a new discovery exemplified by the reproduction of an image of an object through opaque screens by hitherto unknown rays—we allude to Roentgen's discovery of X ray photography. Science had accepted the undulatory theory of light; it had, by referring light phenomena to wave motion of the luminiferous ether, accounted for all the actions of light, a mathematical explanation of refraction and reflection had been reached, and the undulatory theory of light seemed to include actinism or photography. Since the beginning of the present year the epoch making work of Roentgen has been published, and it presents no greater degree of achievement than it does of mystification as it affects the theory of light.

No age has ever witnessed such a succession of triumphs of science in so short a time. The effect of the cumulated wonders is to prepare us for any revelation of science—to almost dangerously increase our powers of belief. They make it harder than ever to discern and fix the true limits of natural science. To the working scientist, the discoveries are an inspiration, for they show him that the extreme elevation of universal knowledge has not yet been reached; he still has heights of discovery to climb, of altitude unimagined seriously by the world of but a decade ago. The synthesis of carbon and hydrogen, the liquefaction of air and hydrogen, the discovery of argon, and the discovery of X ray photography, will add new luster to the names connected with the work. Rayleigh, Ramsay, Dewar, and Roentgen among the pure scientists, and Wilson and Linde among the technologists, will have their fame increased by the renown which their achievements will impart to the expiring nineteenth century.

THE PUBLIC ART LEAGUE OF THE UNITED STATES.

We are in receipt of a copy of the constitution of this league, which has been formed "to promote the passage of a law, or laws, by Congress, requiring that before purchase or adoption by the government of any work of art (sculpture, painting, architecture, landscape design, coin, seal, medal, note, stamp, or bond), the design or model for the same shall be submitted to a commission of experts for an expression of opinion as to its artistic merit; and that the approval of such committee shall be a prerequisite to its adoption."

Richard Watson Gilder, editor of the Century Magazine, New York, is the president, and the list of officers and directors contains some of the most famous names in letters and art in America. We notice among others those of Augustus St. Gaudens, W. M. Chase, Joseph Jefferson, D. H. Burnham, Mrs. M. S. Van Rensselaer, and Charles Dudley Warner.

The object of this league is a distinctly patriotic one, and it should commend itself to all those who have the artistic reputation of their country at heart. The public buildings which are erected by the government of a country, the statues which grace its parks, the parks themselves, the various works of art that fill its museums, and the very designs which are impressed upon all government seals and official documents, are taken by the world at large as representing the best artistic possibilities of the nation.

As a matter of fact, however, it cannot be said that in every case our public works, of the kind enumerated above, do justly express the artistic sense of the American people. Although we have many monuments of art of which any nation might be proud, it is undeniable that others are in existence, and some of them in "high places," which would never have been erected if their design had been first submitted to such a board of experts as the Public Art League is seeking to have established.

According to Article IV of the constitution, persons may become members of the league by authorizing the secretary to sign their names to the constitution. Names should be sent to Mr. Glenn Brown, acting secretary, National Union Building, Washington, D. C.

The Use of Horseflesh in Paris.

The statistical bulletin of the French Ministry of Agriculture, dealing with the consumption of horseflesh in Paris last year, gives the number of horses killed for consumption as food at 23,186, this being exclusive of 43 mules and 383 donkeys. The total weight of meat sold was 5,130 tons, and this was sold at 186 shops or stalls, which are not allowed to sell any other kind of meat. The maximum price ranged from 18 cents a pound for the fillet to 4 cents a pound for the necks and lower ribs. The report adds that not more than a third of the meat is sold at the stalls, the remainder going to make sausages.

THE total salmon pack of the Pacific coast during last year, for the full spring and fall seasons, was 2,034,877 cases. Of this amount 627,000 cases were packed on the Columbia River, 637,000 cases in Alaska, and 512,877 cases in British Columbia.

Wells' Algol Variable.

We have received the following report from Prof. William H. Pickering of the astronomical observatory of Harvard College. The report reads as follows:

A minimum of the Algol star, B. D. + 17° 4367, occurred as predicted on the afternoon of January 5, 1896. Through the courtesy of Professor Young, observations were obtained at Princeton by Professor Taylor Reed, with the 23 inch equatorial. It was also observed by Mr. W. M. Reed at Andover. Preparations had been made at this observatory to obtain a series of photographic images of it automatically, each having an exposure of 5 minutes, to observe it photometrically with the 15 inch equatorial, and also visually with the 12 and 6 inch equatorials. Unfortunately, owing to clouds, few observations were obtained, but these serve to show that the star was faint and diminishing in brightness as expected. Similar preparations were made for the next minimum, January 10, but again clouds prevented observation.

The observations so far obtained show that its time of minimum, uncorrected for the velocity of light, can be closely represented by the formula J. D. 2412002·500 + 4·8064 E. For nearly two hours before and after the minimum it is fainter than the twelfth magnitude. It is impossible, at present, to say how much fainter it becomes or whether it disappears entirely. It increases at first very rapidly and then more slowly, attaining its full brightness, magnitude 9·5, about five hours after the minimum. One hundred and thirty photographs indicate that, during the four days between the successive minima, it does not vary more than a few hundredths of a magnitude. The variation may be explained by assuming that the star revolves around a comparatively dark body and is totally eclipsed by it for two or three hours, the light at minimum, if any, being entirely that of the dark body. The conditions resemble those of U Cephei, which appears to be totally eclipsed by a relatively dark body two and a half magnitudes fainter than itself, but having a diameter at least one-half greater. The variation in light of B. D. + 17° 4367 is more rapid than that of any other star hitherto discovered, and as its range is greater than that of any known star of the Algol type, its form of light curve can be determined with corresponding accuracy. U Cephei is second in both these respects.

THE NEW STAR IN CENTAURUS.

The Nova follows the nebula N. G. C. 5253, and is north of it. The nebula is assumed to be C. DM. —31° 10536, magn. 9·5, with which it was originally identified. As seen with a low power the nebula cannot be readily distinguished from a star. Its magnitude on the Cordoba scale by comparison with adjacent stars was estimated by Mr. Wendell as 9·7, and it could hardly have been overlooked in preparing the Cordoba Durchmusterung, in which many adjacent fainter stars are given. The new star could not have been observed at Cordoba unless we assume, first, that it was bright at that time, although invariably too faint to be photographed on fifty nights distributed over six years; and secondly, that the nebula was overlooked at Cordoba while observing fainter objects in the same region. Even if we make these assumptions, the new star still falls in the same class as T Coronae, which was observed in the northern Durchmusterung several years preceding its appearance as a new star.

The positions of the Nova derived from these plates differ from each other by only 0s. ·1 in right ascension and 1" in declination. The mean position for 1875 is R.A. = 13h. 32m. 51s. ·8, Dec. = —30° 59' 58". It will be noticed that according to these measures, the Nova follows N. G. C. 5253 by 1s. ·7, and is 24" north.

Danger in Mineral Wool.

Another report of the Boston Manufacturers' Mutual Insurance Company calls attention, incidentally, to the danger attending the careless use of mineral wool in certain cases. Every one knows that this substance is made by blowing steam or air through melted iron slag. The slag is a sort of impure glass, and the "wool" is, therefore, a mass of fine threads of glass, interspersed, usually, with globules. The threads, though very slender, being finer than cotton fibers, are of glass, and, as the report points out, pieces of them may, unless the material is carefully handled, get under the nails, or into the skin, causing painful irritation; and when the dust from it is incautiously breathed, it has been known to produce hemorrhage. A similar material is "rock wool," which is said to be made of melted glass, and the fibers of which are even sharper and harder, and, therefore, more capable of inflicting injury than those of the slag wool. It may be noticed that the men who apply the mineral wool, which, it is needless to say, is very extensively used in building, for packing pipes, filling in partitions and floors, and so on, do not handle it much, using sticks to compact it in place, and the American Architect suggests that those who have occasion to use it as amateurs will do well to imitate this precaution.

French Honors for Scientists, Artists, and Men of Letters.

On the occasion of the centenary of the French Institute, Prof. Max Müller, who is an Associate of the Academy of Letters, was appointed commander of the Legion of Honor. Prof. Ramsay and Lord Rayleigh, as well as Messrs. Simon Newcombe, Alexander Agassiz, and Rowland, of the United States, who are all corresponding members of the Academy of Science, were made officers of the Legion of Honor; while Mr. Adolphus Hall, of America, a corresponding member of the Academy of Science, was appointed chevalier of the Legion of Honor. In the new year's batch of promotions in the Legion of Honor three American painters, MacEwen, MacMonnies, and Melchers, are made chevaliers; MM. De Morgan, the director-general of antiquities in Egypt, Dieulafoy, the explorer of Babylon, and Leroy-Beaulieu, the political economist, are made officers; Francis Charmes, the essayist, Jules Claretie, director of the Comedie Francaise, Lavisse, the historian, Maspero, the Egyptologist, Victor Massenet, Gaston Paris, the romance philologist, and Sully-Prudhomme, the poet, are made commanders; and MM. Joseph Bertrand, the mathematician, Gaston Boissier and Ernest Legouvé, of the Academie Francaise, Leopold Delisle, librarian of the National Library, and Garnier, architect of the Grand Opera, are appointed grand officers.

Household Inventions.*

One phase of household economics which should be made more prominent is that of household inventions. Comparing housework with other industries, it is obviously belated in respect to using mechanical devices and labor-saving appliances; for while farming has been transformed by science and invention, and the life of the agriculturist changed from one of plodding drudgery to one of progressive enterprise, the main processes of housework are done to-day just as they have been for many years. Much hard work has been eliminated, it is true, by mechanical arrangements in the building of our houses; by means of waterworks and heating apparatus the heaviest part of the work, the lifting of wood and water, is dispensed with; and much heavy work has gone out of the house to be done by machine operatives in factories; but, confining our attention to the appliances to be daily handled in the inevitable rotary processes of house cleaning, food preparing, etc., we find these generally done in the old ways practiced by our foremothers, and the mechanical devices employed to be few and simple.

The scrub board, the dishpan, the kneading board and rolling pin, the chopping tray and knife, the broom, the mop, the cook stove, the coal scuttle or wood box, still linger. The potatoes are peeled, the peas shelled, the berries hulled, and the fruit seeded by hand in most households, yet invention waits at our doors. There are endless devices for saving steps, for avoiding dust, for transporting things up and down, which might be studied out in the building of our homes and go in with the laths and plaster. The housewife must have her eyes open to this and "boss the job," since the architect views the home chiefly as the social rather than an industrial center, and the carpenter is guided by other considerations than planning to save woman's time. The perfection of a home plant for housework will only be known when the housewife has a head, if not a hand, in the building.

There are many small, inexpensive appliances to be had—carpet sweepers, meat mincers, salad washers, peeling machines, fruit seeders of different sorts. One who has them all will be in danger of being "cumbered with conveniences," but they give better results with less toil than the old ways and should be always at hand. There are also machines for washing things in the aggregate instead of piece by piece; these save much time, wear, and breakage, and are generally successful in the hands of intelligent operatives. Clothes washers and dish washers are favorites with the housewife who does her own work, and will be placed in the hands of household laborers when we learn to estimate intelligence and time value in the kitchen. Speaking from experience, we believe the dish washer saves more time in the average household than the sewing machine and does better work than the average servant.

Besides these, it is our privilege to bring into use a new order of inventions which mean more to the housewife than all that have preceded. These inventions tend to reduce the processes of housework to scientific accuracy and to eliminate the uncertain factors in the kitchen. Now it is quite possible to bring to lawful terms the cook stove and the bread, if not the baby. The use of liquid fuel in the form of coal oil, gasolene, gas, or electricity is now practicable everywhere for cooking and water heating. The construction of heat savers, or non-conducting cases to surround the heating apparatus, and prevent loss of heat by radiation, gives us the reins by which we may hold out heat supply and control it at will. The Aladdin oven and similar inventions which may be constructed for using lamp power and conserving heat by incasing the heating chest in some non-conducting medium, as asbestos paper, are available for all; they may be adapted to cooking on a large or small scale. A cooking thermometer is one of the indispensables of the scientific kitchen. The process of bread making is reduced to an exact science, since by means of the bread raiser and the new ovens, the temperature at which the dough should be kept during the rising and the baking may be perfectly regulated. Material being reliable, the bread maker can depend upon her calculations for uniform success without the eternal vigilance of the old method. The canning of fruit may be made a delightful pastime by using the steam cooker or Aladdin oven with a lamp.

*Hanna Otis Brun, in the American Kitchen Magazine, Boston, January. Condensed for Public Opinion.

Launching of the Helena.

The new United States gunboat Helena and the Plant Company's new merchant ship La Grand Duchesse were launched simultaneously at the yards of the Newport News Shipbuilding Company, Newport, News, Va., on January 30, 1896. The Helena is a flush deck fore and aft schooner-rigged steel gunboat, not sheathed, with a double bottom and closed watertight subdivision at the water line. The dimensions are as follows: Length on load water line (normal displacement), 200 feet; maximum breadth, 36 feet; mean draught (at normal displacement), 11 feet; normal displacement, 1,261 tons; full coal capacity, 380 tons; coal carried at normal displacement, 150 tons. The boat is intended to be manned by 150 officers and men. Propulsion will be by twin screws, actuated by two sets of vertical inverted quadruple expansion engines. An average speed of 14 knots an hour must be maintained for four consecutive hours on the trial trip. The battery consists of four 4 inch guns mounted in the open on the upper deck, two being placed forward and two aft in pairs on opposite sides of the ship; four 4 inch guns in armored sponsons on the gun deck, two on each broadside amidship; four 6 pounder Hotchkiss guns, two forward and two aft in 1 inch armored sponsons. In addition to these, the boat will carry one pounder Hotchkiss and Gatling guns on the main deck and it is provided with a bow torpedo tube.

Incrustation in Gas Engine Jackets.

It is not often that trouble is experienced in gas engines owing to incrustation by lime deposited from the jacket-cooling water, but a case is reported where, in two engines, one of 25 and one of 50 horse power, after having been in operation for about a year, different parts, notably the exhaust valves, were frequently found to be very much overheated, the circulation of the cooling water through the cylinder jackets was impeded, and there were often premature explosions of the gas and air charges in the cylinders. On taking the engines apart, it was found that portions of the water pipes leading to and from the jackets, and even the interior of the jackets themselves, were almost completely choked up with a scaly deposit formed by the precipitation by heat of salts dissolved in the water, the action being in all respects similar to that going on in a feedwater heater. Since, however, as shown by thermometric measurements, the cooling water, in flowing through the jackets while the engines were working, never reached the temperature at which lime salts are known to separate from the water which holds them in solution, it became evident that the precipitation must have occurred during the periods just after the engines stopped working.—Water and Gas Review.

Firing the Indiana's Big Guns.

On a recent run of the battleship Indiana from Newport to Hampton Roads, all the guns of her battery, including the 13 inch rifles, were fired. It was the first time they were fired on board ship, and the test showed that the gun mounts and their installation were entirely successful. Such a result was to be expected; so the test was not so important in this respect as it was in another, namely, the effect of the blast of the heavy guns.

The recent test showed no damage to woodwork or glass, nor any serious injury to the officers and men engaged in the firing, but it was conclusively demonstrated that in certain positions of the turret the man in the sighting hood would be exposed to serious discomfort and sometimes actual injury when the 13 inch gun was fired.

The heavy guns of the monitor Amphitrite were fired in the same manner, to ascertain the effect on her structure and on living animals placed under the decks over which the guns were fired. It was found in her case that no injury resulted to the ship with 12 inch guns, nor to the animals, so far as observed.

Keeping Store Windows Free from Frost.

In large stores a great deal of trouble is sometimes caused by frost forming on the plate glass windows. In Chicago the electric fan has been put into service to avoid this condensation of moisture. The fans are kept going continuously and the current of air seems to carry off the moisture before it can condense and freeze on the glass. It is a new version of the old ventilation cure for the same trouble.